

CLAIMS

1. Solid oxide fuel cell including
 - a cathode;
 - at least an electrolyte membrane, and
 - 5 - an anode comprising a ceramic material and an alloy comprising nickel and at least a second metal selected from aluminium, titanium, molybdenum, cobalt, iron, chromium, copper, silicon, tungsten, niobium, said alloy having an average particle size not higher than 20 nm.
- 10 2. Solid oxide fuel cell according to claim 1 wherein said alloy has an average particle size not higher than 16 nm.
3. Solid oxide fuel cell according to claim 1 wherein said alloy has a mean surface area higher than 20 m²/g.
4. Solid oxide fuel cell according to claim 3 wherein said alloy has, a mean
- 15 surface area higher than 30 m²/g.
5. Solid oxide fuel cell according to claim 4 wherein said alloy has, a mean surface area higher than 40 m²/g.
6. Solid oxide fuel cell according to claim 1 wherein said alloy has a second metal content of from 1% by weight to 99% by weight.
- 20 7. Solid oxide fuel cell according to claim 6 wherein said alloy has a second metal content of from 30% by weight to 70% by weight.
8. Solid oxide fuel cell according to claim 7 wherein said alloy has a second metal content of from 40% by weight to 60% by weight .
9. Solid oxide fuel cell according to claim 1 wherein said alloy has a nickel
- 25 content of from 1% by weight to 99% by weight.
10. Solid oxide fuel cell according to claim 6 wherein said alloy has a nickel content of from 30% by weight to 70% by weight.
11. Solid oxide fuel cell according to claim 7 wherein said alloy has a nickel content of from 40% by weight to 60% by weight .
- 30 12. Solid oxide fuel cell according to claim 1 wherein said second metal is copper.

13. Solid oxide fuel cell according to claim 1 wherein said ceramic material is selected from yttria-stabilized zirconia (YSZ), cerium gadolinium oxide (CGO), samarium-doped ceria (SDC), mixed lanthanum and gallium oxides.

14. Solid oxide fuel cell according to claim 1 wherein said ceramic material
5 has a particle size not higher than 50 nm.

15. Solid oxide fuel cell according to claim 1 wherein said ceramic material has a particle size from 1 nm to 25 nm.

16. Solid oxide fuel cell according to claim 1 wherein said ceramic material is doped with at least one cation selected from calcium, magnesium, strontium,
10 lanthanum, yttrium, ytterbium, neodymium and dysprosium.

17. Solid oxide fuel cell according to claim 13 wherein said ceramic material is cerium gadolinium oxide (CGO).

18. Solid oxide fuel cell according to claim 1 performing in substantially dry hydrocarbon.

19. Cermet comprising a ceramic material and an alloy having a particle size
15 not higher than 20 nm.

20. Process for preparing a cermet including a ceramic material and a metallic material comprising an alloy comprising nickel and at least a second metal selected from aluminium, titanium, molybdenum, cobalt, iron, chromium,
20 copper, silicon, tungsten, niobium, said process comprising the steps of:

- a) producing a precursor of the metallic material;
- b) producing the ceramic material;
- c) combining said precursor and ceramic material to obtain a composite
- d) reducing said composite

25 wherein step a) comprises the phases of

a-1) dissolving a hydrosoluble salt of Ni and a hydrosoluble salt of a second metal in water;

a-2) adding a chelating agent to the solution resulting from step a-1);

a-3) adding an oxidizing agent to the solution resulting from step a-2);

30 a-4) isolating said precursor.

21. Process according to claim 20 wherein step b) comprises the phases analogous to those from a-1) to a-4).

22. Process according to claim 20 comprising the phases of adjusting the pH of the solution resulting from phase a-2) at a value higher than about 5.

5 23. Process according to claim 20 wherein phase d) is carried out with hydrogen at a temperature ranging between about 400°C and about 1000°C.

24. Method for producing energy comprising the steps of:

- feeding at least one fuel into an anode side of a solid oxide fuel cell comprising an anode comprising a ceramic material and an alloy comprising
10 nickel and at least a second metal selected from aluminium, titanium, molybdenum, cobalt, iron, chromium, copper, silicon, tungsten, niobium, a cathode and at least an electrolyte membrane disposed between said anode and said cathode;

- feeding an oxidant into a cathode side of said solid oxide fuel cell; and

15 - oxidizing said at least one fuel in said solid oxide fuel cell, resulting in production of energy.

25. Method according to claim 24 wherein the at least one fuel is hydrogen.

26. Method according to claim 24 wherein the at least one fuel is an alcohol.

20 27. Method according to claim 24 wherein the at least one fuel is a hydrocarbon in gaseous form.

28. Method according to claim 27 wherein the hydrocarbon is substantially dry.

29. Method according to claim 24 wherein the at least one fuel is a hydrocarbon in liquid form.

25 30. Method according to claim 24 wherein the at least one fuel is substantially dry methane.

31. Method according to claim 24 wherein the fuel is internally reformed in the anode side.

30 32. Method according to claim 24 wherein the solid oxide fuel cell operates at a temperature ranging between from 500°C and 800°C.